TOO FAT TO FIGHT - TOO WEAK TO WIN, SOLDIER FITNESS IN THE FUTURE?

A MONOGRAPH
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First Term AY 96-97

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	14 JANUARY, 97	MONOGRAPH - FINAL (TERM I)

4. TITLE AND SUBTITLE

TOO FAT TO FIGHT - TOO WEAK TO WIN, SOLDIER FITNESS IN THE FUTURE?

5. FUNDING NUMBERS

6. AUTHOR(S)

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

SCHOOL OF ADVANCED MILITARY STUDIES (SAMS)
COMMAND & GENERAL STAFF COLLEGE (CGSC)
FT. LEAVENWORTH, KS 66027

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT

APPROVED FOR PUBLIC RELEASE:
DISTRIBUTION UNLIMITED.

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words) THIS MONOGRAPH EXAMINES THE RELATIONSHIP BETWEEN THE U.S. ARMY'S PHYSICAL FITNESS PROGRAM AND THE PHYSICAL COMBAT READINESS OF THE COMBAT ARMS SOLDIER. LINKING TOGETHER PHYSICAL FITNESS STANDARDS, PHYSICAL TRAINING, AND COMBAT READINESS IS DONE BY USING ENTRANCE AND RETENTION STANDARDS, IET AND UNIT PT & TESTING. THE MONOGRAPH ARGUES THAT TODAY'S PHYSICAL FITNESS PROGRAM IS NOT CAPABLE OF PRODUCING THE COMBAT ARMS SOLDIERS REQUIRED. RECOMMENDATIONS FOR OVERCOMING THE DEFICIENCIES ARE PROVIDED. THE CONCLUSION THAT ONLY A THREAD OF LINKAGE EXISTS BETWEEN THE PROGRAM AND SOLDIER'S COMBAT READINESS. STRENGTHING THE LINKAGE OF THE PROGRAM TO THE PRODUCT (FIT COMBAT ARMS SOLDIERS) IS THE KEY.

14. SUBJECT TERMS

PHYSICAL FITNESS, PHYSICAL COMBAT PERFORMANCE

15. NUMBER OF PAGES

62

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

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Title of Monograph: *Too Fat To Fight-Too Weak To Win, Soldier Fitness In The Future?*

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Accepted this 22nd Day of January 1997

ABSTRACT

TOO FAT TO FIGHT-TOO WEAK TO WIN, SOLDIER FITNESS IN THE FUTURE?
by MAJ Mark R. Forman, USA, 47 pages.

This monograph examines the relationship between the United States Army's physical fitness program and the physical combat readiness of the combat arms soldier. Linking together physical fitness standards, physical training, and combat readiness is accomplished using entrance and retention standards, initial entry training (IET), and unit physical training and testing. The actual physical combat task performance depends on the quality of the soldier produced by the physical fitness program.

Past and present physical fitness doctrine and the physical nature of the combat environment are examined to provide a touchstone for the readers information. The monograph then argues that today's physical fitness program is not capable of producing the combat arms soldiers the U.S. Army requires. Misconceptions about the positive affects of mechanization, the over importance of aerobic fitness, female physiological limitations and the negative aspects of body fat composition, all contribute to a flawed program.

Recommendations for the U.S. Army to overcome the current program deficiencies are to increase the accession standards, improve organizational training and establish physical standards based on combat requirements, not general wellness. The conclusion of this monograph is that only a thread of linkage exists between the U.S. Army's physical fitness program and the combat arms soldier's combat readiness. Strengthening the linkage of the program to the product is the key to filling the nation's combat arms with the most survivable, lethal and combat ready soldier in the future.

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Chapter I. The Evolution of Military Physical Fitness

> ***Stripped for the hardest work, every muscle firm and elastic, every ounce of brain ready for use, and not a trace of superfluous flesh on his nervous and supple body, the American stood in the world a new order of man.***[1]
>
> ***Henry Adams, 1801***

American males 100 years ago were subject to a harsh, demanding environment that weeded out the weak and promoted physical toughness. The agriculturally based economy used physical labors instead of mechanical effort to produce goods and services. Today's American male is not as physically tough as his predecessor. The sedentary nature of the post industrial age has created a society less physically fit. Unfortunately, ground combat has not become less physically demanding. This poses a significant problem for raising modern military forces. Developing an effective physical fitness program to compensate for a recruits lack of physical preparation is an important element in building a successful fighting force.

A comprehensive military physical fitness program would have to address four distinct program elements: recruitment, retention, evaluation and training. The program would be guided by standards that ensure both physical fitness and minimum physical performance. Army regulation and public law for military selection define the first element, entrance standards. The second element is the enforcement of individual physical retention standards. The third, unit physical training and testing, is conducted to develop and assess individual physical fitness for retention, promotion and arguably combat readiness. The final element is a minimum standard for actual physical combat task performance. A program that successfully joins the four elements will enable the

Army to develop a soldier that is able to perform his duties and physically endure the rigors of combat.

Despite over 80 years of experience, the U.S. Army has never had a physical fitness program that integrated physical fitness for induction and physical performance requirements. The physical fitness standards for induction, and retention have evolved through time. The first induction standards were designed to avoid bringing sick men into the military. As induction standards evolved, medical evaluations became more stringent and a table of minimum physical body dimensions were enforced. Retention standards grew to include maximum standards for obesity and the ability to achieve consistently a passing score on the Army Physical Fitness Test (APFT). Nevertheless, the Army did not develop a single program designed to produce the most combat ready soldier.

The U.S. Army's first serious attempt to set induction standards came in 1916 when the Selective Service System was created. Although individual physical performance would be important on the battlefield, the initial attention was necessarily focused on getting the quantity of suitable men needed to fill the expanding Army. The definition of suitable proved to vary in accordance with the quantity of men needed.

For example, entrance standards have always included a minimum standard for height. Initially, height was part of a general health screening process. Short stature was believed to show a lack of well being. Early in the 19th Century the minimum height for U.S. soldiers was 66 inches. It has been progressively lowered since. The minimum height dipped to 60 inches in 1864, 1918 and 1940. The reduction was caused by the

need to expand the population of fighting manpower based on the demands of war.[2] Today, height standards serve the practical need (Men: below 60 inches or over 80 inches; Women: Height below 58 inches or over 80 inches[3]) to limit the range of sizes for uniforms, protective ensembles, and work space dimensions.

The history of how the Army developed its current physical standards is helpful to understand the problem. Army physical standards for induction were originally set to screen out sickly soldiers who were unable to meet the physical demands of military service. This simply meant, selecting soldiers who at least looked as though they could carry a load and fight well. Despite the original intent, the results were far different. General Omar Bradley commented on the physical state of many recruits in WWII:

> The rudest shock we experienced with the draftees was the discovery that they, the prime youth of America, were generally in appallingly poor physical condition(...) Some of our draftees could not walk a mile with a pack without keeling over. Most were overweight and soft as marshmallows. Only a very few were capable of the hard sustained physical exertion that we knew they would experience in combat.[4]

The need to procure literally millions of men to fight World War II (WWII) inevitably lowered the standards for induction. The Army could not afford the luxury of instituting standards for obesity nor could it seriously consider using a physical fitness test for screening out sub-standard soldiers.

The complaints about the physical condition of draftees caused the government to commission a study. Dr. Gwendolyn Drew, a physiologist at the University of Pittsburgh, under took a study of draftee fitness. Concluded in 1945, Dr. Drew's study showed that there had been dramatic shortcomings in America's preparation of young

men for war. Forty-five percent of all selective service registrants at the outbreak of WWII were unable to meet induction standards. Dr.Drew's study showed dramatic shortcomings in America's ability to prepare pre-draft age youth for war. Dr. Drew also observed that following every major war, dating back to the Revolutionary War, Congress had disapproved bills seeking appropriations for pre-draft age youth physical and military training. In each case, post-war legislation had been initiated to remedy the poor condition of draftees.[5]

The Army's principal concern remained induction standards until the end of the draft in 1973. The use of draftees had forced the Army not only to continuously select new draftees for induction but also had ensured that a large portion of the Army would be separated after two years of service. With the end of the draft, retention of fit soldiers became more important. One of the first retention issues was obesity. Following WWII most of the attention to height-weight relationships was directed at underweight soldiers. Men less than 105 pounds were excluded from military service. Overweight was not a fixed criterion. The Army asked that the examining physician to determine whether the inductees condition was overweight. If an inductee's body fat and appearance was greatly out of proportion to their height or interfered with normal physical activity he was not accepted. The examining physician could accept an apparently overweight recruit, if in his opinion, the variation was correctable with proper nutrition and physical conditioning.[6] In the early 1960s, the Army adopted accession standards establishing minimum and maximum weights for height.

In 1976 the Army placed greater emphasis on overweight and fatness when they published new retention standards. Until 1976, body weight was a screening tool that excluded only the extremes of underweight and obesity. Today, body weight and body fat standards are the only physical standards used that exclude or eliminate soldiers based upon some relationship to combat readiness and military appearance.[7] Although body fat correlates poorly with physical performance, it is, nevertheless, used as a surrogate measure of physical fitness. Lean soldiers look more physically fit than large, fat soldiers. The 1976 version of Army Regulation (AR) 600-9 combined the physical fitness and weight control program regulations, and created stringent height-weight retention standards for active duty soldiers.[8] The stated emphasis of the regulation was physical fitness. Weight control and military appearance were seen to be related to physical performance.

In 1980, President Carter initiated an assessment of military physical fitness programs. A panel of government scientists conducted a review and in 1981, the Department of Defense (DOD) issued directive 1308.1 carrying out the panel's recommendations.[9] The DOD directive specified that retention standards are based on screening weight tables. The final retention determinations were based on a new objective body fat assessment, instead of a physician's opinion. The DOD directive recommended 20 percent body fat for males and 26 percent for females, with services "authorized to set more stringent standards."[10] The Army adopted the 20 percent base line figure recommended in the directive for males. The female standard of 26 percent was subjectively raised based on the assumed difficulty to meet the 26 percent figure.

The Army published its initial body fat standards in 1982. The standards were based on subjective estimates of the body fat percentage associated with a desired level of aerobic fitness. The standards were supported by the observed relationship between percent body fat and maximal oxygen uptake (VO_2max), the marker for aerobic fitness.[11] In general, lower body fat composition results in a higher VO_2max during aerobic activity. The standards are considered to be a fair assessment of individual aerobic fitness and general appearance, however, they lack correlation to muscular fitness.

The third element of a comprehensive physical fitness program is physical training and testing. The Army's physical fitness training program begins at IET, intended to prepare recruits, both mentally and physically, to join organizational units. The physical capacity of a soldier is set prior to enlistment yet can be developed based on the individuals physical training regime. The current emphasis in many units on the APFT as the focal point for the physical training program is a practice that leads to under-developed individual combat potential. The evolution of the APFT from the five event version of the late 70s, to the current three event test is a reflection of the same problem. The APFT is a general fitness test, not a combat fitness test. The APFT measures physical activities that have not been scientifically related to combat task performance. The over-arching structure that a comprehensive physical fitness program should provide is not there. The result is a physical fitness test that may not measure what it should--combat physical fitness.

Today's all volunteer Army, established in the 70s, is on the tail end of a drastic peacetime reduction. The reduction in the Army's end-strength has not reduced the

portion of available manpower needed to fill the combat arms. The combat arms accounted for 20.5 percent of the total enlisted end-strength in 1985 and 23.8 percent in 1996.[12] The increase in percentage of the enlisted strength required to fill the combat arms suggests a need to develop a large pool of physically ready combat arms soldiers. Unfortunately, the U.S. Army's present program for producing physically ready combat arms soldiers is marginal at best. The Army does not base its physical standards on physical combat task performance. The standards are focused more on general health and physical well being, rather than physical fitness for combat readiness.

The fourth element of a comprehensive physical fitness program is a minimum standard for actual physical combat task performance. Most would agree that readiness for combat begins with the physical fitness of the individual soldier, NCO and officer. Combat arms soldiers must possess the stamina and strength to successfully perform potential combat missions. Although there are historical examples of men performing great acts of military courage while physically disabled (wounded, ill, disoriented), they are the exception, not the rule. History captures these acts precisely because they are so exceptional. The common denominator in the equation of individual combat readiness is the level of physical fitness each combat arm soldier possesses when fighting.

The determination of the physical combat tasks associated with a military occupational specialty (MOS) and for common soldier skills is very difficult. The study of history can reveal some truths to what physical combat skills may be required. History along with scientific study may contribute to this body of knowledge, disclosing the actual physical combat tasks. Once the tasks are determined, standards for the first

three elements (recruitment, retention, evaluation and training) can be appropriately set to attain them.

United States Army physical fitness policies and programs are subject to constant reform and revision. Scientific discovery and physiological education are causes for continuous physical fitness program reform and training. Now is the time for the U.S. Army to establish a comprehensive physical fitness program. Evolution from meager induction requirements through elaborate body fat composition standards have occurred over time without focus. Effectively gathering the four elements of the program under one over-arching policy will refocus it on combat readiness. A program that successfully joins the four elements enables the Army to place the most combat ready soldier in its ranks and into the next conflict.

Chapter II -Military Physical Fitness Defined

The U.S. Army's goal is to have a physically fit fighting force. Military physical fitness denotes the capacity to do physically demanding tasks. A more appealing description of physical fitness may include an effective state of combat physical conditioning. Physical fitness is generally considered to consist of three components: aerobic fitness, muscular fitness, and body composition. Physical trainers can further subdivide muscular fitness into two elements: muscular strength and muscular endurance.[13]

Flexibility is a fourth dimension of physical fitness. Flexibility is the ability to move the joints through a range of motion. Flexibility will not be addressed in detail because scientific study into this aspect of physical fitness for military purposes are limited. Conclusions reached on the value of flexibility to combat task performance would be only conjecture and not based on empirical evidence. The flexibility of the soldier's body is important for general fitness, yet flexibility seems less important than the other components when physical combat tasks are considered.

The components of physical fitness are interrelated, yet not totally transferable. If this were not so, testing for only one dimension of fitness would reveal the actual capacity in all the components. Testing just one component, such as muscular strength, does not totally measure overall fitness. Body composition, which is the ratio of fat to lean tissue of the body, affects the individual's muscular and aerobic capacities. Body composition effects the dynamic performance of an individual on a case by case basis. For example, an obese person may have a high level of muscular strength, yet have

minimal aerobic capacity. This decreased aerobic capacity will quickly lead to exhaustion and fatigue, a huge detriment to physical combat readiness. A universal rule of physiology is that exerting muscular force, for extended periods, leads to exhaustion and fatigue. This rule applies to all individuals to varying degrees. An individual's aerobic capacity relates directly to the length of time that a person is able to exert their muscular force. Better aerobic capacity enables greater muscular strength and endurance levels. The person's aerobic capacity is a significant indicator of when an individual will become fatigued. A lower aerobic threshold equates to earlier fatigue.

The battlefield is no place for those who quickly fatigue. The ability to continue to perform physically is limited by a variety of physiological and psychological factors. A decrease in capacity to perform physically is called fatigue. Individuals' can counter fatigue by maintaining a high state of physical fitness before engaging in physically demanding tasks. The famous Green Bay Packer's football coach, Vince Lombardi, coined the phrase, "fatigue makes cowards of us all" to stress the importance of conditioning and to express his desire to have every man on his football team in top physical shape.[14] The component of physical fitness most closely associated with fatigue is aerobic fitness, or cardiorespiratory endurance.

Aerobic fitness is the ability to participate in sustained arduous physical activity for extended periods.[15] The U.S. Army's FM 21-20 defines it as, "the efficiency with which the body delivers oxygen and nutrients needed for muscular activity and to transport waste products from the cells."[16] The international criterion for measuring aerobic fitness is maximal oxygen uptake per unit of time (VO_2max). VO_2max means the

maximal amount of oxygen a person can process in a unit of time specified for testing. The volume is expressed in liters per minute (L/min), or relative to a person's body weight, in milliliters per kilogram body weight per minute (ml x kg-1 x min-1).[17] The next component of physical fitness is muscular fitness. Muscular fitness is a complex term that a single notion does not adequately describe.

Like physical fitness, muscular fitness consists of more than one component: muscular strength, and muscular endurance. Muscular strength is the greatest amount of force a muscle or muscle groups can exert in a single effort. Muscular strength is sometimes called explosive strength or power. Muscular endurance is the ability of a muscle or muscle groups to perform repeated movements with a sub-maximal force for extended periods.[18] Examples of muscular endurance include exercises such as the push-up or sit-up and lifting weights multiple times. These two terms (muscular strength and muscular endurance) are important to the designers of military physical fitness programs because combat task performance requires high levels of both. Developing a program to improve combat arms physical fitness can increase both aspects of muscular strength.

Body composition is the final aspect of physical fitness. It is the amount of body fat a soldier has in comparison to his total body mass.[19] A more thorough definition is the ratio of fat tissue to total body weight, including fat and lean (fat-free) tissue. The Army pares down the number of potential recruits by enforcing body composition standards. United States AR 40-501 Standards of Medical Fitness specifies acceptable weights (in pounds). The weights are related to age and height for both males and females, for initial Army recruitment. Body composition is the final determinant for

evaluating a recruits acceptability. Recruit's with excess body fat composition levels are considered obese and rejected from service.

During their career, soldiers are continuously screened for body fat composition levels. Individuals must not exceed body fat composition standards during mandatory bi-annual testing. Retention standards for body fat composition are specified in AR 600-9, The Army Weight Control Program. Body fat composition is only considered when the weight exceeds the screening table weight. If the person exceeds the weight table allowance, percent body fat is measured per the method described in AR 600-9. The same guidance applies for active duty and reserve personnel who exceed the weight for height tables (screening table weight) found in AR 600-9.

The Army's body fat composition standards are the most equitable in the armed forces today. The Army's standards are both age and gender normed. Individual's allowable body fat increases as they age. Physiological differences, between genders, are addressed by the increasing allowable body fat composition for females. Army personnel exceeding the following maximum percent body fat standards are considered obese: (Chart shown on next page)

Age group: 17-20	
Male (% body fat):	20
Female (% body fat:	30
Age group: 21-27	
Male (% body fat):	22
Female (% body fat):	32
Age group: 28-39:	
Male (% body fat):	24
Female (% body fat):	34
Age group: 40+	
Male (% body fat):	26
Female (% body fat):	36[20]

Individuals identified as obese are subject to administrative action and are placed on the overweight program. After continued failure to achieve the standards, obese personnel are then eligible for separation.

Analysis of the allowable body fat composition tables highlight a disturbing truth. The body fat composition standards for each respective gender vary greatly. The difference between male and female body fat composition standards shows a difference in the mean for a population of both genders. Females are, for the most part, smaller yet carry more body fat than their male counterparts. If one standard was set for all personnel, females would have a difficult time attaining the same standards as most males. The additional ten percentage points of body fat, allowed females across the entire age-based system, are an extremely large difference. This suggests a tendency of Army policy makers to avoid truthful analysis of the issue. The Army's policy on body fat composition allows physically less qualified individuals to remain in the force because of politically motivated gender sensitivity.

The gender issue illuminates the problem of implementing general health standards instead of performance based standards. The foundation for developing Army physical standards, like the body fat composition standard, is the U.S. Army's training doctrine. Current physical fitness doctrine does not set the foundation to build a sound physical fitness program. The objective of the Army's physical fitness program, specified in AR 350-41 Training in Units, is to enhance combat readiness by developing and sustaining soldiers with high levels of physical fitness. This is an excellent objective,

however, the regulatory guidance stops short by publishing the following list of inadequate qualifiers:

> cardiorespiratory endurance; muscular strength and endurance; flexibility; anaerobic conditioning; competitive spirit, the will to win, and unit cohesion; self-discipline; body-fat composition as prescribed by AR 600-9; a healthy lifestyle that includes good nutrition, avoidance of smoking and avoidance of drug use; ability to cope with stress.[21]

The regulation's emphasis is on general health and individual well being, not on combat physical readiness. It gives a starting point that requires a much more robust and detailed training program focusing on combat readiness. The guidance only offers a sound recipe for the average American to enjoy a healthy lifestyle and probably live longer. The U.S. Army soldier requires much more than just a healthy lifestyle to close with and destroy enemy soldiers in combat. Performance based standards can bridge the gap created in the current program by specifying duty related, physical combat task performance objectives.

The problem begins with the applicability of the guidance. The guidance applies Army-wide, and includes all soldiers, functional branches, units and operating agencies. If the guidance specified higher expectations for combat arms soldiers, then a better representation of the extreme physical demands of combat would be established. The current Army guidance only specifies the importance of individual physical fitness. The guidance provides a weak foundation for physical combat readiness. The Army must implement standards and regulatory guidance that demand more from individuals and

training programs. Policy-makers should develop a comprehensive program that responds to the foreseeable needs of combat.

The Army has published some combat and duty related soldier physical fitness standards. These standards are not commonly enforced and are poorly integrated into the overall physical fitness program. The Army has defined the physical fitness level required by each occupational specialty. For example, U.S. AR 611-201 Enlisted Career Management Fields (CMF) and Military Occupational Specialties (MOS) specifies that infantrymen (CMF 11) are required occasionally raise and carry a 160-pound person on their back. The regulation further states that the infantry man frequently walks, runs, crawls, and climbs over varying terrain for a distance up to 25 miles. They also require that infantrymen do various other lifting tasks while carrying a minimum of 65 pounds evenly distributed over the entire body.[22] This is a good representation of the physical rigors combat arm soldiers are expected to endure. This nominal standard applies to all infantrymen and denotes a requirement to select soldiers capable of accomplishing the tasks. The soldiers must conduct physical training on a regular basis to maintain that capability. The Army should develop programs for average soldiers to meet the physical demands of combat based on informed views and training requirements.

Chapter III - Physical Fitness Versus Combat Performance

Establishing individual physical fitness standards with objective test measures is a difficult proposition. No training program can ensure that every soldier will have the physical prowess needed for the most demanding combat task. However, it stands to

reason that the higher degree of physical fitness attained before combat, the better prepared the individual soldier will be to face battlefield challenges. But, what are the physical demands of combat? This is difficult to determine with scientific accuracy.

The Army's training community has two ways to determine battlefield physical demands: the review of history and controlled scientific research. Many examples from modern warfare display the intense, strenuous and physically exhausting nature of combat. Some observers have concluded, wrongly, that mechanization and tremendous advances in technology have decreased the demands for individual physical fitness. In some cases physical requirements have actually increased. Research scientists have studied the physiology of soldiering for years. Recent studies have concentrated more on the physical demands of combat. Results from these studies have produced a litany of combat related physical tasks and associated data to describe the physical requirements to do them.

The false notion that advancements in mechanization and automation will significantly reduce individual muscular strength requirements persists today. Typical military tasks associated with a large strength fitness component are lifting, pushing, pulling, throwing and carrying heavy loads for short distances. Muscle strength is a primary factor in the physical demands of one-third of all enlisted occupations.[23] Additionally, 76 out of 350 occupations in the U.S. Army possess a "very heavy" lifting requirement.[24] The M1A2 armor crew is a great example. The M1A2 Main Battle Tank is a virtual high technology demonstration of modern weaponry. Traveling at high speeds it finds and destroys enemy elements with ease and precision. One assumes that

the armor crewman surely has little, if any, physical labor to perform. This assumption is wrong. For instance, the tank commander is required to raise and lower the 80-pound hatch on the commander's cupola. In addition, the loader is burdened with a heavier more lethal round than his predecessor. The 120mm HEAT and Sabot rounds used today weigh more than 50 pounds each (M120, M830 HEAT-T, length 38 inches, weight 53 pounds). The M1A2 tank's basic load is more than one ton of rounds. The crew must upload each round to the tank and then transfer the round individually into the ammunition storage compartment. This is not a one man job. The crew sets up an assembly line to pass the rounds from the ground to the top of the tank; from the top of the tank to inside the tank; and from the inside of the tank to the ready racks in the turret and hull where they store the ammunition. The M1A2 holds 40 rounds of main gun ammunition. Tanks in combat are expected to fire as often as every four to six seconds, requiring the rounds to be loaded repeatedly in a short time.[25] This is a substantial requirement for muscular strength and endurance.

Armor crew strength is a critical factor in emergencies requiring the evacuation of injured tankers. If a crewman is killed, wounded or knocked unconscious inside a disabled tank, another crewman, or the entire crew must lift him out. The tank crewman's coveralls are tailored with a special set of reinforced straps for lifting a disabled crewman. The tremendous strength required to perform this lifesaving task is highly dependent on the strength of each soldier. The armor crewman's occupational strength requirement is just one of hundreds available to illustrate the physical requirements of the modern army. Another is the light infantryman.

Light infantry soldiers today carry heavier loads than ever before. Data collected from soldiers at the Joint Readiness Training Center (JRTC) show that individual loads are averaging 88 pounds. In fact, it is not uncommon for some of these soldiers to carry more than 140 pounds.[26] The Infantry School's planning guidance suggests a maximum of 72 pounds for approach marches and 48 pounds for combat actions. If expressed as a percentage of the average infantryman's body weight (165 pounds), the typical soldier at the JRTC may carry between 53 and 85 percent of his body weight. Occasionally, units carry an average of 99 pounds per individual load or 60 percent of body weight. Assistant Dragon Gunners carry the most extreme load of 167 pounds. This load exceeds the average infantryman's body weight. Heavy individual loads are a reality of the modern day combat environment. Despite the occasional availability of transport, for either the load, the soldier or both, the ability to carry a heavy load on some soldiers back remains today.

A brief review of selected historical accounts offers a glimpse of the physical demands of combat. However, individual incidents or circumstances cannot easily translate into general propositions. A historical account from the western front, 1918 during WWI, reflects the intense physical demands of combat. The U.S. 2nd Division, with two U.S. Marine Corps (USMC) regiments attached, were among twenty-nine U.S. divisions in France. Sustained combat operations became the norm for most units fighting on the western front. The following examples are drawn from the experience of the 1st Battalion, Fifth Regiment, USMC moving up to Soissons, France in mid-July, 1918.

> ...how those men, two days without food, three nights without sleep, after a day and a night of forced marching, flung off their weariness like a discarded piece of equipment, and at the shouting of the shells sprang fresh and eager against the German line.[27]

These battlefield conditions may never be repeated, yet the description illuminates the intense physical hardship that each individual soldier faced. In the days that followed this engagement, the fighting continued with no respite for the weary marine regiment. Years later, in another far off land, the U.S. Marine Corps was again pitted against a formidable opponent, the Japanese in WWII. On September 15th, 1944 the 1st Marine Division attacked the island of Peleliu. The unit had been highly trained for the rigors of combat, and reflected the hard physical conditioning when battle came. The combat environment the unit faced was rich in physically demanding tasks. Running, jumping and lifting was the norm as the 1st Marine division progressed across the island. Running in a crouched position, while wearing battle fatigues, load carrying equipment (LCE), and other combat equipment (helmet, individual or crew served weapons, ammunition, etc.) is very difficult even in a sterile environment. The extreme stress associated with battle contributes to the physical exhaustion infantrymen faced while doing these physically demanding tasks. Many of these demands are described in the following excerpt from E.B. Sledge's, With The Old Breed:

> We moved rapidly in the open, amid craters and coral rubble, through ever increasing enemy fire. I saw men to my right and left running bent as low as possible. The shells screeched and whistled, exploding all around us. In many respects it was more terrifying than the landing, because there were no vehicles to carry us along, not even the thin steel sides of an amtrac for protection. We were exposed, running on our own power through a veritable shower of deadly metal and the constant crash of explosions.[28]

This account accurately depicts the stress and some physical tasks associated with combat operations. Although the first two descriptions are from the USMC, the requirements of the infantryman are similar to those of a U.S. Army infantryman.

From the coral and craters of Peleliu to the jungles of Vietnam the physical demands of the combat arms soldier remained consistent. The 1st Cavalry Division (Airmobile) fought in the Ia Drang Valley in the fall of 1965. The following accounts are from the battle on 14 November, 1965 at LANDING ZONE (LZ) X-RAY.

> ...we were advancing toward the enemy when two of my men and one from another squad were hit by machine-gun fire... I crawled to aid the wounded. I was able to drag two of the wounded back to our defensive line. ...As I attempted to drag a third back I was wounded."[29]

> All this time I had been jumping, dodging, hitting the dirt, and moving forward with Adams [assistant gunner]. ...I was feeding belt after belt of 7.62mm ammunition into the gun. We were prone and he was firing at the enemy in front and to the right.[30]

The excerpts describe the enduring nature of combat. Combat related physical tasks executed in the jungles of Vietnam are similar to those executed in the past and present. The requirement to evacuate fallen comrades continues to this day. Handling ammunition and heavy weapons while lying in a prone position is physically very difficult. The ability to lift a disabled comrade and carry him to safety is a dynamic lift. The task is more easily accomplished by a stronger individual. Physical training that uses a buddy lift or free weights to develop balance while hoisting a dead weight is the preferred way to build that type of strength. Aerobic conditioning enables individuals to carry the weight for a longer distance. Enhancing aerobic capacity by training to an arduous standard will facilitate execution of the carry for a longer time and distance. A

physical training program that seeks a balance between strength development and increased aerobic capacity produces a more capable combat soldier.

The current world situation requires the U.S. military to execute support and stability operations on a global basis. Recent peace-keeping, peace-enforcement or humanitarian assistance operations include operations in Somalia, Rwanda, Haiti and Bosnia. The missions are none the less hazardous and characterized by physical hardships. In July 1993, when soldiers of the 2d Battalion, 14th Infantry Task Force, 10th Mountain Division deployed to Mogadishu, Somalia they experienced the harsh conditions. The unit became the ground element for the 10th Division brigade serving as the Quick Reaction Force (QRF) for the Untied Nations command in Somalia.

While deployed in Somalia, fatigue was a constant factor. Contributing to soldier fatigue were daily temperatures that hovered in the 90s, and humidity readings of 80-100 percent. The uniform for the soldiers involved in the Somalia mission consisted of either the heavy or medium weight desert camouflage uniform (DCUs), LCE, M17A1 protective mask, helmet, body armor, and assigned individual or crew-served weapons. The combination of extreme heat and the required uniform drained even the fittest soldiers. Soldiers carrying excess body fat would probably struggle more in these conditions than well conditioned, aerobically fit ones. Heat and humidity have been shown to have a degrading effect on soldier performance.[31]

Highlighting the physical demands of combat, Task Force 2-14 IN (-) attacked an objective consisting of two large compounds in Mogadishu on 13 September 1993. An overcrowded hospital near the objective was a major Somali National Alliance (SNA)

militia base. Following the attack to clear the compounds, the unit began to withdraw. Rocket propelled grenades (RPGs) and automatic weapons' fire erupted from the area of the hospital, sparking a major firefight between TF 2-14 IN and the SNA militia, lasting almost five hours[32]. Soldiers maneuvered for over two-kilometers of urban terrain while under continuous enemy fire. The infantrymen used physically exhausting individual movement techniques during the entire move. Three casualties were sustained, but the unit did not slow and maintained its formation. The soldiers who evacuated the casualties were physically fit. Evacuation of casualties is a very physically demanding activity that the soldiers had trained to accomplish. The soldiers in TF 2-14 IN were no less physically challenged than their predecessors in WWII and the Republic of Vietnam.

Future battlefields will vary in intensity from low to high and pit U.S. forces against a vast array of potential adversaries. The chances of lesser conflicts occurring appear to be on the rise, occasioned by increased urbanization, population growth, regional migration and competition over scarce natural resources. Predictions are that future warfare will require an increased presence by conventional combat arms soldiers. Soldiers will execute a wide array of national security related tasks. The physical demands required to execute future missions will probably be like previous modern day combat and near combat situations. Twenty-four hour operations over extended periods, increased weapons' capability (lethality, range, survivability, etc.), and worldwide deployments, require a high degree of individual physical combat readiness.

The pure strength and endurance needed to do combat related tasks are immense. Well-rested soldiers, in good physical condition, attempting combat related tasks are

hard pressed to accomplish them. The task is made doubly difficult by adverse weather, difficult terrain and enemy fire. The physical capacity of the soldier is also degraded by a lack of sleep, food, water and energy. The ability to fight a close, violent fight with a well-rested enemy is critical even against these odds. Despite physical pain and discomfort, soldiers have to be able to climb, crawl, run and jump after the adrenaline is gone. The physical condition of individual soldiers at the onset of an operation will influence their ability to withstand these rigors and maintain reserves to ultimately fight the close fight.

Historical accounts provide a start for exploration into the physical demands of combat. Researchers at the U.S. Army Research Institute of Environmental Medicine, Natick, Massachusetts have used more scientific methods to determine individual physical performance combat requirements. The researchers conducted studies throughout the 80s to determine the relationship between peacetime physical training and the physical requirements of combat.

A research study, "Physical Fitness and Infantry Operations," examined the physical fitness of 34 infantry soldiers over a five day simulated combat exercise. Tests measuring various components of physical fitness were administered to soldiers before and after a realistic simulated combat exercise. The components of fitness examined included aerobic capacity, body composition, anaerobic capacity, and muscle strength.[33] Senior noncommissioned officers administered the APFT to the study participants before and after the five day simulated combat exercise. The researchers obtained data on maximal oxygen uptake (VO_{2max}), body composition, muscular strength and anaerobic

capacity. The results showed no significant decrement in field performance during the exercise. These findings may reflect that the soldier's physical training was sufficient to meet the demands of the exercise. The results may also show that the rigor associated with the study was not enough to tax the soldiers' physical capacity. A third possible conclusion is that soldiers overcame potential adversity through cooperative effort and teamwork. The researchers also noted the soldier's reduced upper body strength and anaerobic capacity following the five-day field exercise. This study suggests that upper body exercise capacity is important for infantry operations and is subject to decrements during field operations.

Researchers from other countries have studied combat related physical task performance. A Canadian researcher reported that for the past three decades, the idea of physical fitness for the Canadian Army was based on prediction of physical performance. Factors such as low body fat, ability to run fast for extended periods and the ability to do a large number of push-ups, sit-ups and chin-ups were considered combat related. The Canadian Army presumed that the ability to run well indicated a high relative VO_2 max and the ability to do high numbers of push-ups, sit-ups or chin-ups indicated a high level of muscular strength and endurance.[34] United States researchers have proven that the two-mile run associated with the APFT is a valid measure of aerobic fitness. The two-mile run test has a high correlation with VO_{2max}.[35] Muscular strength and endurance are tested by the APFT sit-up and push-up events. The correlation to individual strength capacity is not as well defined as the determination of VO_{2max} is with aerobic fitness. The question of whether or not push-ups and sit-ups measure a combat related strength

capacity is even less well defined. Educating the Army's junior leadership on this issue is critical. Junior leaders are primarily responsible for physical fitness training program design and execution.

What are the real requirements of combat for one of the primary combat arms, infantry? The Canadian Military reviewed the individual, combat associated, physical tasks of an infantryman. Infantry branch was selected from a group consisting of armor, artillery, infantry and combat support. The one thing all groups had in common was the fact that they could all be called upon to perform the duties of the infantryman in a combat environment. The Canadian Command Council agreed that the infantry soldier's physical tasks were the most demanding in the combat arms group described above.

Over five hundred different combat tasks were identified as a result of the process. Five of the most physically demanding tasks expected were identified as a representative group to be evaluated. Common tasks selected: casualty evacuation, ammunition box carry, jerry can transport and use, dig a slit trench (Canadian equivalent to a fox-hole), and weighted road march.[36] The development of this list, along with similar studies by United States researchers, indicate that the majority of the physically demanding tasks involve the physical handling of materials, equipment or personnel. Although lower body strength is important for the infantryman, the primary muscle strength and endurance challenge is for the upper-body (trunk, shoulders, chest, arms and hands). An obvious conclusion one can draw from this analysis is that individuals, with superior upper body strength are the preferred candidates for filling the infantry's ranks.

It is generally accepted that soldiers who are the most successful on the APFT are the most physically capable. Soldiers possessing the highest fitness levels generally perform their duties better. Information gathered following the Falklands War, somewhat contradicts this logic. There, soldiers who had a fitness level similar to typical marathon runners (height 5'9";weight 139; 5% body fat[37]) were least successful in carrying out their duties although they had high VO_2 maximum values.[38] Commanders in the Falklands noted that soldiers who were most successful were those who had large muscle mass type of bodies and superior upper and lower body strength.[39]

The importance of getting the right soldier into the combat arms must be linked to combat effectiveness. Deciding who is combat effective is a difficult proposition. The U.S. Army's attempt to qualify the term "combat effective" is found in regulatory guidance. Individuals' with high physical fitness levels are generally considered the most combat effective. To be combat effective, all soldiers must be physically capable of performing the full range of tasks associated with their MOS.[40] The term "combat effective" denotes a definable level of physical capability, or fitness, specified for each combat arms soldier in AR 611-201, Enlisted Career Management Fields and Military Occupational Specialities.

As stated earlier, establishing individual physical fitness standards with objective test measures is a difficult proposition. Addressing this tough issue is essential to the development of a comprehensive physical fitness program. An effective program increases the odds that every combat arms soldier will have the appropriate combat physical fitness level. The higher degree of physical fitness attained before combat, the

better prepared the individual soldier will be to face evolving battlefield conditions. History and modern research lend valuable insights into the individual physical tasks combat conditions may require soldiers to perform. Analysis of the requirements must provide the departure point for the Army's physical fitness program.

Chapter IV - Analysis and Results

The reviews of history and scientific studies of combat physical fitness reveal some disturbing trends. Combat physical fitness and military physical fitness, in general, are terms that generate confusion. Military trainers' have speculated on the requirements to improve and develop soldier fitness. Their speculations have occasionally been based on false assumptions. Exposing some of the underlying myths associated with military physical fitness will enable the Army to develop a viable physical fitness program.

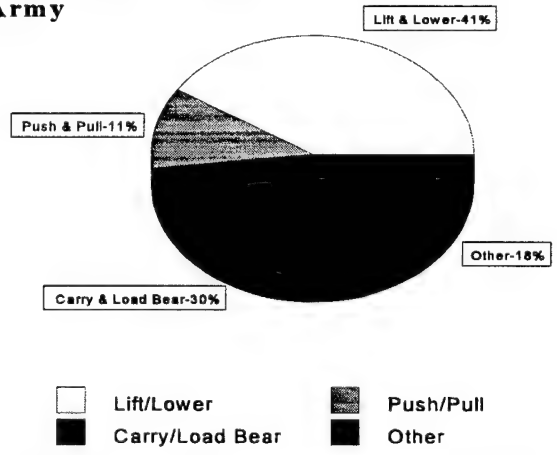
Before looking at the misconceptions, a brief review of the preliminary conclusions is in order. A summary of insights gained by reviewing history and modern research enables us to compile a tentative list of combat related physical tasks or activities. The historical evidence presents several enduring factors. Mechanization and technological advancements do not diminish the individual physical demands of combat. Muscular strength is a vital factor in combat task completion. Individual activities such as lifting, pushing, pulling, throwing and carrying heavy loads recur on all battlefields. The capacity to perform these activities appears to be directly related to the level of individual aerobic conditioning at the onset of combat. Higher levels of physical conditioning lead to longer sustained ability to withstand the demands of combat. The demands of most battlefields include fatigue, stress, continuous operations and a physically determined enemy.

Modern research provides additional insights into the general observations gained by reviewing history. Sustained combat operations require ample upper body strength. Long distance runner builds are not ideal and more muscle mass is better for combat

related task completion. Other important factors lending to combat task completion are motivation level, previous athletic participation, lifestyle before service and the quality of both initial entry training and unit physical training. This litany of factors potentially informs the development of a comprehensive physical fitness program. Starting with this information and building the requirements for selection, retention and organizational physical training programs provides the best path to overall combat readiness.

Another vital link to developing a sound physical fitness program is the need to dispel commonly held misperceptions. A widely held misconception is that aerobic fitness, associated with running, road marching, cycling and swimming, is the most important fitness component for military purposes. Analysis of U.S. Army occupational specialties revealed that the most frequently performed physically demanding tasks involve heavy lifting, carrying, pushing and pulling (Figure 1).[41]

FIGURE 1- Most Frequently Performed Tasks In The U.S. Army



Vogel, J.A. Analysis of 1,999 critical tasks across all job categories

Muscular strength and endurance are more important than aerobic fitness for the successful completion of these tasks. Muscular strength is downplayed for several reasons. Lack of appreciation of strength requirements, availability and cost of strength training equipment, and the time that must be dedicated to a strength training program are some of the known reasons why this is true. The general lack of understanding of the basic principles of strength training can also be attributed to the limited appreciation of muscular fitness.

The aerobic component of fitness is the most often studied because it is easily isolated from the other components. Aerobic emphasis in the Army is based on its relationship to many military tasks and the aerobic health benefits of body weight control. In addition, aerobic training is simple to conduct, requires no equipment and builds unit esprit. The benefits of aerobic fitness and the associated increases in stamina are not to be disregarded. The key benefit is the ability to execute muscle movements more effectively over a longer sustained period of time. The Army acknowledges the disparity in priority between muscular and aerobic fitness in FM 21-20, Physical Fitness Training. FM 21-20 lists, as a common error, failing to strike a balance in physical training programs between cardio-respiratory endurance training and muscular endurance and strength training.[42]

Another false notion about the requirements of military or combat fitness is that females are physically capable of serving in the combat arms. A growing number of Army personnel and policy makers are considering the use of female "manpower" in the combat arms. The facts in this area are clear. A 1985 U.S. Army investigation showed

females exhibited 60 to 65 percent of the upper and lower isometric force of men.[43] A U.S. Navy study found the dynamic upper torso strength of Navy females ranged from 46 percent to as high as 58 percent of men.[44] This can be attributed to the females greater percentage of fat mass and lower muscle mass. When compared to the average male Army recruit, the average female Army recruit is 4.8 inches shorter, weighs 31.7 pounds less, and has 37.4 pounds less muscle mass and more fat mass (Figure 2).[45] Additionally, fat mass is inversely related to aerobic capacity and heat tolerance, thus the average female is also at a disadvantage when performing aerobic activities such as heavy road marching and working in hot environments.

Figure 2- Comparison of Body Composition Measures for Male and Female Army Recruits

	Male	Female	Change
Measure	Mean	Mean	
Height (Inches)	68.9	64.1	-4.8
Weight (Pounds)	160.4	128.7	-31.7
Lean Mass (Pounds)	133.5	96.1	-37.4
Fat Mass (Pounds)	26.9	32.6	5.7
% Body Fat	16.8	25.3	8.5

Myers 1984

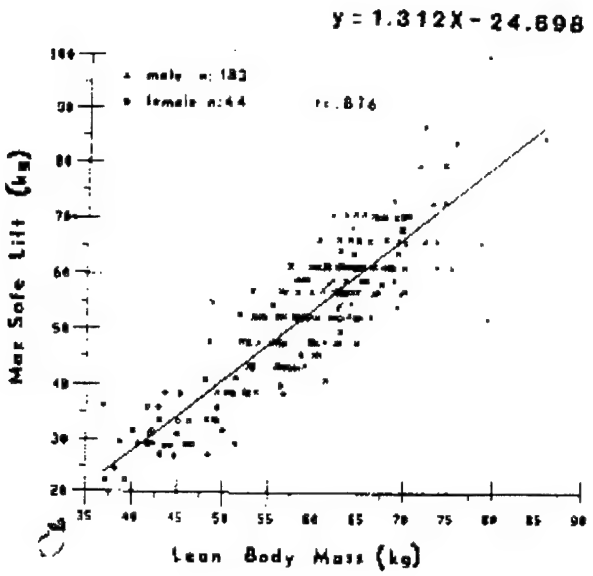
Generally, females are at a distinct disadvantage when performing military tasks requiring muscular strength due to their low muscle mass. The most important factor related to strength is probably the total mass of muscle involved in a muscle contraction. The muscle mass can be related to the cross sectional area of the muscle. The quality of

muscle tissue and quantity of muscle fibers in males and females are the same. Muscle produces approximately six to ten kilograms of force per square centimeter of muscle cross sectional area.[46] The difference between males and females is the cross-sectional area of muscle fiber. Males cross-sectional muscle fiber is 30 percent greater than females.[47] This physiological difference in the two populations accounts for the disparity between the two genders.

Another factor affecting strength is androgen levels. Androgens are potent muscle building hormones that are responsible for much of the male muscle growth associated with the adolescent growth increase. Androgens are also responsible for muscle growth as a result of strength training. Higher androgen levels are found in men and account for the differences in strength capacity between males and females. The low androgen levels found in females account for the lack of muscle enlargement from strength training.

Females can improve their strength, however, they generally do not develop large muscles. Results of an investigation into specialty-related lifting, carrying, pushing and pulling performance of male and female recruits illustrate the differences. The results reflected the performance of females during muscularly demanding tasks ranged from 59.4 percent to 69.6 percent that of males.[48] The relation between maximum lifting capacity and lean body mass is presented in Figure 3, depicted on the next page.

Maximum
Safe LIFT



Lean Body Mass

Figure 3- **Scatter Plot Of The Relation Between Maximum Lifting Capacity An Lean Body Mass Vogel, 1985**

It is clear from the data in this diagram that the strongest females fall in the same strength category as the middle to lower end males. The majority of the females have significantly lower lean body mass and lift much less than their male counterparts. This presents a possible dilemma. How can the Army select for combat, from the top performers of the females available to fill a combat arms positions when the majority of the available male manpower is just as, or more capable? The answer is simple. Unless there is a significant shortage in military manpower, the position should be filled by a male recruit. Taking the example one step further, the combat arms selection criteria

should screen out most females strictly based on muscle strength capacity. The other limiting factor, when considering female physical capacity, is their aerobic fitness.

The cardio-respiratory capacity is directly related to the delivery of oxygen by the heart, lungs and blood vessels to the working muscles. Generally, females have a smaller heart mass, cardiac output and heart volume than males. The amount of blood transferred during each contraction and blood hemoglobin content of females is lower than that of men. Thus, the blood transfers less oxygen, which coupled with lower cardiac output, results in lower female aerobic capacity. Evidence of this fact is found in reports made on Army recruits with average entrance VO_2 max scores of 51 ml/kg/min for males and 37 ml/kg/min for females. The females score is 73 percent of the males.[49] Maximal run times have been used by the military to assess aerobic fitness. Research findings indicate that one and two mile run times of Army females were 74 and 79 percent of men, respectively.[50] These findings are conclusive evidence female soldiers, as a population, are not the best candidates for the physically demanding combat arms.

A third misconception, generally held by many, is that excess body fat is always undesirable. Over fatness cannot be directly associated with less fitness.[51] What may be considered an acceptable or optimum level of fatness in one MOS may be unacceptable in another. Thus, it is important to note, when considering the relation of fatness to physical fitness, the occupational requirements or the fitness component involved must be examined. Fat tissue is designed for storing energy and has no force producing capacity. Therefore, it does not aid in force production, serving only the passive energy storage function. It does have mass, thereby increasing the force producing requirements of the

musculature for both supporting the body against gravity and to overcome inertia during acceleration. Thus, as fat is added, the body's ability to accelerate decreases. For example, as body fatness increases, the muscular power required in running to advance the runners body with each step increases. Running performance decreases as overall body weight is added, independent of aerobic capacity.

The relative negative effect of added fatness on body movement decreases as external weight is carried, as in road marching, because fat weight makes up a smaller portion of the total weight being accelerated. The negative effect of excess fatness on body mobility is primarily during non-loaded exercises like running or walking. The relative importance in carrying loads during road marches, a more common Army activity, is much less. The inverse of the effects of fat are the effects of added muscle.

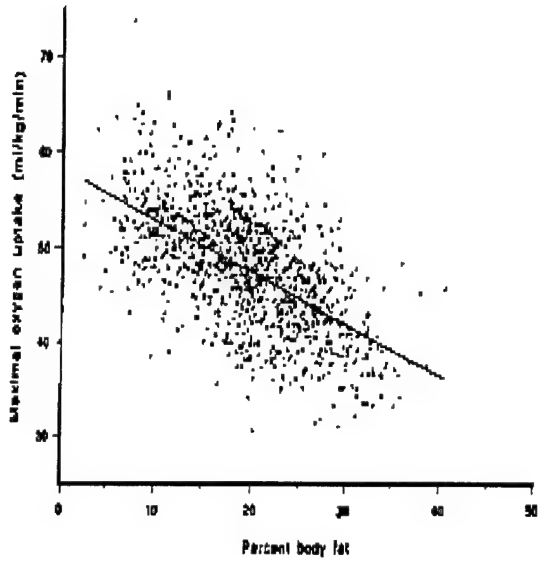
Developing added muscle mass creates additional mass that must be propelled, however, the mass that is built generates muscular power. The cost-benefit ratio of developing more muscle mass will depend on the activity the individual is expected to perform in their occupation. Added muscle mass is a handicap to the long-distance runner, yet, it is an advantage during short, maximal sprints. In tasks involving the movement of external weights, such as lifting, pushing, pulling, and carrying, performance is enhanced by added muscle mass and largely unrelated to fat mass.

For the combat arms soldier, the advantage of added power producing capacity more than compensates for the added weight to be supported. The preponderance of muscular strength requirements in the combat arms compared to body mobility requirements brings into question the emphasis placed on maximal body fat standards.

The provision for a minimal muscle mass standard would be of much greater benefit to the combat arms and the Army in general.

Scatter Plot of the Relationship Between VO2max and Percent Body Fat in Male Soldiers. VO2max = 58.254-.544%BF. R=-0.60, SEE=5.02

Maximal Oxygen Uptake (VO2max)



PERCENT BODY FAT

Figure 4- Scatter Plot Of The Relationship Between VO2max And Percent % Body Fat In Male Soldiers. Vogel, 1992

Relating combat physical fitness to body fat composition is important. The relationship of combat physical fitness to body fat composition standards is not clearly established in the Army's current physical fitness program. Dr. James A. Vogel, in one of his many studies, describes the development and disparity of the Army's body fat composition standards. The description presented earlier in this paper of the relationship

between percent body fat and VO_{2max} is the key to this anomaly. This relationship is depicted in Figure 4.[52]

> As can be seen from this figure, a desirable level of aerobic fitness of 50 ml oxygen uptake per kg body weight per minute for young male soldiers is equivalent to a body fat percentage of 20. Thus, a value of 20 percent was used as the base for standard, adding an upward adjustment of 2 percent body fat units per age group as well as a gender adjustment of 10 percent.[53] Subsequent research has offered supporting evidence for these figures, but only for aerobic fitness.[54]

The linkage illustrated in Figure 4, and the description provided in the quote, are explanatory information that lends credence to the Army's methodology for developing the body fat composition standards. Keep in mind that percent body fat standards established in this way reflect an association with a largely arbitrary APFT standard, not a physical combat performance standard.

Personal physical fitness has been assessed by health or wellness oriented testing and not by combat task related tests based on the physiological working capabilities of the soldiers. The APFT requirements are based on a perceived level of fitness required for military duties and provide a motivational challenge to the soldier. The Army has a body fatness standard based on perceived fitness requirements rather than on objective combat task requirements. In addition, it is based primarily on one aspect of fitness, aerobic, and ignores the other components of muscular strength and endurance. The APFT measures for strength or strength endurance are the sit-up and push-up. Neither of these items are correlated with any actual Army tasks, such as lifting.[55] Body fat percentage is believed to be related to aerobic physical performance, and some evidence suggests lower body fat composition is related to strength and endurance.

An example of the type of soldier best qualified to complete combat related tasks is found in a Canadian Forces study. The soldiers best able to complete the Canadian Forces, 19 event, Indoor Standardized Obstacle Course (ISOC) had lower percentage body fat than others.[56] The course assesses soldiers fitness by executing tasks similar to those expected to be encountered during combat (sprinting, crawling, pulling, lifting, carrying and pushing). Event selection was based on their ability to assess the major components of fitness related to the performance of military tasks. Forty-three healthy males, 21 to 31 years of age, underwent intense laboratory testing. The top and bottom ten performers scores were compared in relation to the body fat percentage. Computing the mean scores for each group of ten, the results indicated that the high performer group had a mean of 10.7% body fat, whereas the low group's mean was 19.5%. Reasons cited for the performance differences were poor physical fitness level of the low achievers compared to high achievers, and the lower achievers were carrying excess fat weight, requiring greater physical effort, thus slowing them down.[57]

The first part of the findings are in conflict with the data assessment provided by Vogel. The general fitness level may only be lower than the physical fitness level of their peers, yet they may possess adequate overall fitness levels to perform the minimum requirements of combat. The observations indicate that the high achievers, for activities with high muscular strength and endurance demands, tend to have lean and mesomorphic body builds.[58] Selecting the most qualified individuals to serve in the combat arms based solely on body fat composition is not adequate. Generally, high body fat composition is

undesirable, however, individual strength and aerobic capacity must be considered for each person.

In theory, every individual is assumed to possess a certain range of muscular strength and endurance that is genotypically determined. The actual phenotypical value may be divided into two categories: basic or minimal strength, and strength superimposed by training. Basic strength is considered to be characteristic of each individual. The training component of the individuals strength may vary according to the demands placed upon him. The ability to perform combat related physical tasks will be enhanced by a quality physical training program that progressively increases physical demands and develops individual strength capacity.

The Army's unit physical training program is the foundry of hardened combat arms soldiers. The U.S. Army Physical Fitness School, Fort Benning, Georgia, developed the battle focused physical training (BFPT) program. Emphasizing and elaborating on the sound physical training doctrine FM 21-20 describes, BFPT cautions commanders that train only to succeed on the APFT as the sole objective of physical fitness (Figure 5):

Figure 5- BATTLE FOCUSED PHYSICAL TRAINING

-USAPFS-

	Monday	Tuesday	Wednesday	Thursday	Friday
Unit PT Program Aimed At High Average On APFT:	3 Mile Run Push-up Imp.	Interval Run Sit-up Imp.	Calisthenics Stretching	Company Run Push-up Imp.	4 Mile Run Sit-up Imp.
	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Battle Focused Unit PT Program:	3-Mile Ability Group Run at 80-90% MHR	6-Mile Foot March, LCE & 50 lb. Ruck 90 Minutes	Obstacle Crs. 2 Rotations	Guerilla Drills 20 Minutes Push-up, Chin-up, Sit-up ---- Circuit 20 Minutes	Squad run to Pool (last man up 20 min. Swim/H20 Drills

Legend: 1. Imp = Improve 2. MHR = Max Heart Rate 3. LCE = Load Carrying Equip.

The program is designed for implementation at the unit level throughout the Army. BFPT is a tool for commanders to use in the development of physical training programs geared toward the units combat requirements. The BFPT program directly links the individual soldier's physical fitness to the units combat mission by crosswalking the unit mission essential task list (METL) to physical training events executed daily.[59] This emerging doctrine is a common sense link of individual training to unit combat readiness. Physical training five days a week is sufficient to physically train combat arms soldiers for combat. If the physical training program is properly planned and executed, individual fitness levels across the unit are raised.

Deciding on the most desirable qualities of a potential combat arms soldiers should be influenced by the findings of these studies. The major observations are: muscular fitness is as important as aerobic fitness, males on average possess more physical capacity than the physically best females, and body fat composition is not the most reliable determinate of physical performance. The ability of the Army's physical fitness program to identify, develop and maintain combat arms soldiers with the right physical attributes is vital to national defense.

Chapter V- Conclusions and Recommendations

A man who takes a lot of exercise rarely exercises his mind adequately.[60]
Captain Sir Basil Liddell Hart, Thoughts on War, 1944

Liddell Hart's notion of the necessity of physical training is debatable at best, and more likely, flat wrong. The mind is at work every time the body is exercised. The mental aspect of physical training is, on many occasions, more difficult than the actual labor. The tradeoff of physical conditioning time, against time devoted to training military minds is just as important. The view of this military thinker was uninformed and assumed that the development of the mind and the body are independent of each other. This is exactly the kind of misinformed thinking that this paper attempts to enlighten. Many notions were presented as unfounded or debatable. Reviewing the facts allows the reader to draw their own conclusions.

Training geared toward improved individual combat fitness can develop combat arms soldiers who are capable of performing the required physical tasks. It is important to keep in mind, that when developing performance standards for continuous effort tasks (lasting over 30 minutes), any minimum fitness requirement above 50 percent of a groups mean score should be considered unacceptable as a desirable fitness level.[61] The caution in this case is creating a demand for a fitness level that may be unattainable by some individuals, regardless of how hard they train to improve their physical capabilities. According to sources at the United States Army Infantry Training Center at Fort Benning, Georgia, the failure of a single soldier to complete basic training represents a cost to the government of $16,000.00.[62]

Recruiting and training of Army personnel must respond to a changing environment. The size of the Army and training resources are both decreasing at substantial rates. Simultaneously, the military is viewed as a more desirable option for America's job seeking youth. The result is that the Army can and must be more selective in recruiting and retention of quality personnel. The waste of resources caused by a soldier who begins but fails to complete basic training is considerable. The facts demand institution of simple methods to screen potential recruits for the qualities required to successfully complete IET.

Recruit screening is directly related to the Army's physical fitness program. If a comprehensive physical fitness program is developed, then a complete understanding of the desired outcome is necessary. Individuals with the requisite muscle strength, aerobic capacity and body fat composition should be identified for selection and training. Determining which individuals have the "right stuff" is a difficult proposition. The physical attributes are important, but not exclusive. Other factors contribute to selecting the most qualified individual. The potential recruits motivation level, mental aptitude, lifestyle before enlistment and cultural background are important factors in determining recruit suitability before the U.S. Army enters their life.

Recent studies show that a number of factors correlate with measures of training success. One example is that the trainee's self-reported fitness activity prior to entering the Army correlates with training success.[63] Assuming that the recruits are truthful in reporting, this is not surprising because athletically inclined individuals are expected to be more physically fit. The drawback to this predictor is that the reports are a subjective

measurement, and the differences in scores are not large enough to use as selection criteria. Similarly, correlations with weight, height, and body mass index are not useful.[64] The correlation between intake variables and training completion of 649 trainees undergoing a 13-week cycle of basic and advanced infantry training are displayed in Figure 6:

Figure 6- Correlation Between Intake Variables and Training Completion

Variable	Separated	No APFT	Fail APFT	Complete
Age (years)	20.2	20.2	19.5	20.0
Height (inches)	69.6	69.4	70.5	69.3
Weight (pounds)	162	155	178	160
Body Mass Index (Kg/m2)	23.5	22.7	25.2	23.6
Pulse	71.4	73.2	72.5	72.2
Systolic Blood Pressure	121	119	122	120
Diastolic Blood Pressure	73.5	72.0	70.7	72.2
Initial APFT Results:				
Push-Ups/2 Min.	25.9	32.2	24.7	37.1
Sit-Ups/2 Min.	37.8	44.1	38.3	44.8
2-Mile Run	18:11	16:50	17:14	16:04
Self-Reported Fitness Scores:				
Running	0.78	0.81	0.91	1.06
Aerobic	1.65	1.62	1.86	1.79
Weight Training	1.30	1.05	1.21	1.60
Total Score	3.73	3.48	3.99	4.46
Non-Numeric Variables:				
Injury				
Yes (n = 107)	16 (15%)	8 (7%)	3 (3%)	80 (75%)
No (n = 531)	58 (11%)	35 (7%)	62 (11%)	376 (71%)
Smoking				
Yes (n = 185)	32 (17%)	13 (7%)	21 (12%)	119 (64%)
No (n = 453)	42 (9%)	30 (7%)	44 (10%)	337 (74%)

Snoddy Jr., & Henderson, 1994

Figure 6 shows that the best predictors of IET success are the trainee's performance on the APFT and the trainee's history of cigarette smoking. The APFT scores reflect the trainee's state of physical fitness and reveal intangible factors like motivation. Cigarette smoking, like self reported fitness activity, is subjective. Smoking represents a habit

clearly shown to negatively influence health and performance in the long term, and serves as a predictor of short term IET success.

National health statistics indicate that of high school graduates, 37 percent exercise regularly, 29.6 percent smoke cigarettes, and 28.6 percent are overweight.[65] The recruit eligible population is derived from these high school graduates and non-graduates who statistics are not available to review. The health statistics are alarming, with well under half of high school graduates exercising regularly, while almost a third smoke and are overweight. Non-graduate health standards are assumed to be even worse than students who are subject to physical education and athletic competition.

This study presents two insightful findings. The first is that the Army should consider a history of cigarette smoking as a negative screening criteria for potential recruits. Attempting to screen out undesirable recruits is required to establish a population within the Army of potential combat arms soldiers. Secondly, administering the APFT to new recruits should be considered at the MEPS, prior to IET. The APFT is a valid predictor of successful IET completion and should be used to screen out physically un-fit recruits. Implementing these two recruit screening measures saves valuable resources. Potentially, the screening of recruits in this manner, provides the Army a more physically qualified soldier.

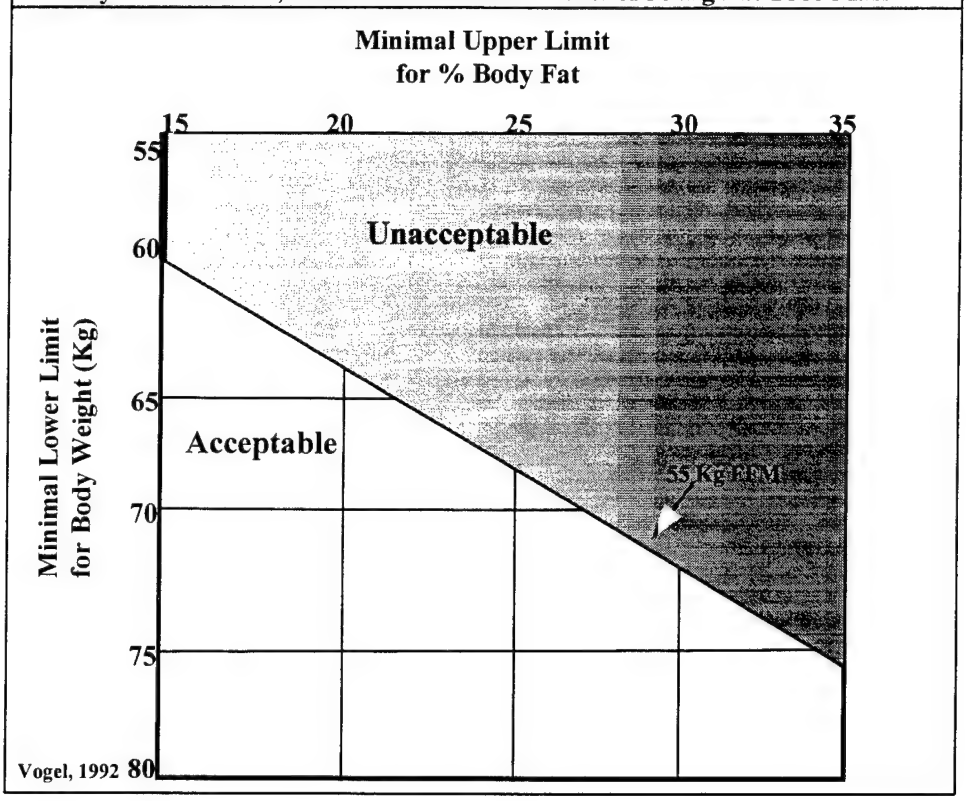
Army recruiting standards do not adequately select the best recruits for the combat arms. Noted earlier, strength fitness has a limited relationship to body fat composition but is related to overall muscle mass. Muscle mass is difficult to measure separately and is commonly estimated from the more readily determined fat-free mass. Fat-free mass

also contains bone, connective, and other structural tissue, yet only muscle is readily altered and therefore fat-free mass is representative of the muscle mass present.[66] Screening measures that determine the recruits fat-free mass are more desirable than body fat composition standards. The recruits potential to complete combat related physical tasks depends on his total fat-free mass. The ability to perform in combat is therefore directly related to his total fat-free mass.

The relationship between maximum lift capacity and fat-free mass was illustrated in Figure 3, page 33 of this monograph. The data in Figure 3 indicate that in men, a fat-free mass of approximately 50 kilograms is the minimum required to achieve a lift performance of 100 pounds. Physiologically, it has been determined that separate fat and muscle mass standards are best to reflect the individual capacities of aerobic fitness and muscle strength fitness. To date the Army has not attempted to implement such a standard because it has been judged too complex. The time to act is now. Implementing new standards increases the individual combat readiness of the entire U.S. Army.

The entrance screening is an ideal time to establish and determine a minimum level of fat-free mass commensurate with a minimal acceptable level of muscular strength required for future service. Shown on the next page, Figure 7, depicts allowable body weights as a function of the percent body fat standard, based on the desired level of 50 kilogram fat-free mass.[67]

Figure-7 Nomogram for allowable Body weights as a Function of the % Body Fat Standard, Based on the Desired Level of 50 Kg Fat-Free Mass



Doctor Vogel's data in Figure 7 show the minimal acceptable body weight, at various percent body fat standards, required to yield a fat-free mass of at least 50 kilograms. Implementing fat-free mass standards for potential recruits provides the Army a strength capacity screen at the MEPS. This type of screening would be faster and safer than actually lifting or executing other strength tests. This will assist the Army's pursuit of qualified combat arms soldiers at the onset, but what can be done to enhance the soldiers physical development following AIT?

Unit BFTPs are an essential step in the development of combat ready individual soldiers. The implementation must be a command priority at division level and below, with emphasis placed on unit combat readiness physical training, not the unit APFT average score. Physical training programs should incorporate muscle strength and endurance regimes for small unit and individual training. This may require centralized

control of physical fitness centers, similar to the range scheduling procedures in place at most installations today.

The bottom line to this discussion is that there exists in the Army today, only a thread of linkage between the Army's physical fitness program and the combat arms soldier's combat readiness. Most data illustrates a growing concern for the proper selection and training of the nation's military manpower. Strengthening the linkage of the program to the product is the key to successfully filling the nation's combat arms with the most survivable, lethal and combat ready soldier in the future.

ENDNOTES

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3. Omar N. Bradley, A General's Life (New York, New York: Simon & Schuster, Inc., 1983), 106.

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6. Karl E. Friedl, "Body Composition and Military Performance: Origins of the Army Standards" (Washington DC: National Academy Press, 1992), 44. Original source: Foster, W.B., I.L. Hellman, D. Hesford, and D.G. McPherson, "Physical Standards in World War II" (Washington DC: Office of the Surgeon General, Department of the Army, 1967).

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men, age 20, in the 1912 Medico-Actuarial tables (Davenport, 1923)[noted below], which represented average weight-for-height of the insured U.S. population at the turn of the century(...) Both of these new male and female standards for retention in the Army were considerably more stringent than the accession weight standards (AR 40-501, 1960) at that time." Davenport, C.B., "Body-build and its Inheritance"(Washington DC: Carnegie Institute of Washington, 1923), No. 329.

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10. U.S. Department of Defense, Directive 1308.1, Physical Fitness and Weight Control Programs (Washington DC: Department of Defense, 29 June 1981), Enclosure 2, page 2. The desirable body fat figure was originally 15 percent. The value was based on a consensus by panel members who felt that the figures would require revision as a better understanding was gained of the relationship between health and body fat.

11. James A. Vogel, "Obesity and Its Relation to Physical Fitness in the U.S. Military," Armed Forces & Society, 18, no. 4 (Summer 1992): 504.

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32. William, C. David, Lieutenant Colonel, U.S. Army, "Preparing a battalion for combat: physical fitness and mental toughness," Infantry, January-February 1995, 27 & 30. The account is summarized by the author to highlight the salient points. The following information is extracted from the article and provides additional facts and circumstances surrounding the action:

a. 13 September, 1993. TF 2-14 IN (-) attacks to clear two large compounds in the vicinity of Benadir Hospital. Intelligence sources had indicated that these compounds contained large weapons caches and quartered personnel involved in attacks against the United Nations Operation in Somalia (UNOSOM) forces. The operation escalated into a four hour firefight with the SNA Militia. TF 2-25 Aviation provided attack helicopter support. TF 2-14 IN suffered three wounded in action (WIA), and enemy casualties are

estimated at 60 killed or wounded.

b. The SNA was the political apparatus in support of "warlord" Mohammed Farah Aideed following the 1991 overthrow of President Siadd Barre and the subsequent civil war. The SNA Militia was the active military arm of this organization. Its leadership was composed primarily of former Somali Army officers and many of its soldiers had military experience.

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35. Joseph Knapik, CPT, USA, "The Army Physical Fitness Test (APFT): A Review of the Literature," Military Medicine, 154, no. 6 (June 1989), 326.

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